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DEFENSE SYSTEMS MANAGEMENT COLLEGE

PROGRAM MANAGEMENT COURSE
INDIVIDUAL STUDY PROGRAM

THE USE OF A MATRIX ORGANIZATION
TO SUPPORT DEVELOPMENT PLANNING IN
AIR FORCE SYSTEMS COMMAND (AFSC) DIVISIONS

STUDY PROJECT REPORT
PMC 77-1

Richard Lawrence Shearer, Jr.
Major USAF

FORT BELVOIR, VIRGINIA 22060

THE USE OF A MATRIX ORGANIZATION TO SUPPORT DEVELOPMENT PLANNING IN AIR FORCE SYSTEMS COMMAND (AFSC) DIVISIONS

Study Project Report

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Defense Systems Management College

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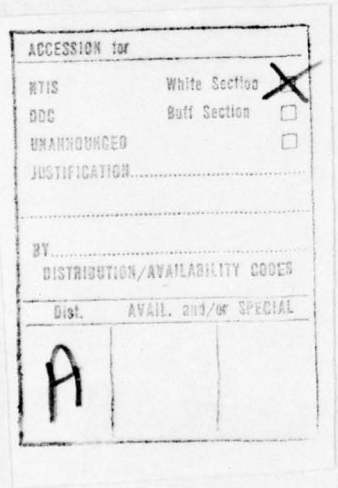

by

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Study Project Advisor
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DEFENSE SYSTEMS MANAGEMENT COLLEGE

STUDY TITLE: The Use of a Matrix Organization to Support Development Planning In Air Force Systems Command (AFSC) Divisions

STUDY PROJECT GOALS: Describe the functions and responsibilities of AFSC Development Planning activities in systems acquisition with emphasis on technology interface activities and relationships with program offices. Determine if a matrix organization could be effectively used to improve such activities and, if so, to develop a recommended usage including responsibilities, functions, and reporting channels.

STUDY REPORT ABSTRACT: The ultimate purpose of the study was to find a means to improve the interface between Development Planning and program offices in operating divisions of Air Force Systems Command. The report examines the functions and responsibilities of the two types of offices and contrasts the values of assigned personnel. The interface activities described include information flow, technology needs, technology program assessments, investment strategy, and independent research and development.

Based on personal and telephone interviews with people who were familiar with the interface activities and on the literature convering matrix organizations, coordination, and integration, the author develops a proposed organization to improve the interface by assigning team members to Development Planning for reporting and evaluation purposes, but physically working in program offices.

The report discusses advantages and disadvantages, concludes that the proposed organization would improve the interface but with an associated manpower cost, and recommends a gradual implementation to balance benefits with manpower requirements.

SUBJECT DESCRIPTORS: Technology Needs, Development Planning, Matrix Organization, Linking Pin, Space and Missile Systems Organization, Aeronautical Systems Division, Electronic Systems Division, Organizational Concepts, Organizational Analysis.

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EXECUTIVE SUMMARY

In the operating divisions of Air Force Systems Command (AFSC), Development Planning offices have responsibility for activities related to the Conceptual Phase of the acquisition life cycle, while program offices have responsibility for Demonstration/Validation, Full Scale Engineering Development and Production of weapon systems. Development Planning offices have responsibilities in three major areas: initial conceptual planning for future weapon systems; management of advanced development programs to design, develop, and test components, subsystems, and techniques to improve the technology base; and promotion of technology transfer including a major role in technology needs, technology program assessments, investment strategy, and Independent Research and Development.

These responsibilities require a reasonably strong interface with program offices and access to timely, accurate information from program offices on changing requirements, progress, and problems. However, accomplishment of interface activities is often marginal because people in the two offices have different values and objectives. People in Development Planning have a relatively long-term time orientation and view their work as supporting the total organization, while people in program offices are more concerned with near-term problems and are committed to program office goals almost to the exclusion of other people's objectives.

To improve the interface between the two types of organizations, a "reverse" matrix organization is developed and recommended where the members of the matrix team would be assigned to Development Planning for reporting and evaluation purposes, but would physically work in program

offices. Only one team member would be assigned to a program office, even if the program office had responsibility for managing several systems or subsystems. The team member would be the focal point in the program for technology transfer, interfacing with Development Planning and AFSC Laboratories, and identifying potential applications of new technologies.

This report develops the concept of a "reverse" matrix organization to support both Development Planning and program office requirements and outlines proposed functions, responsibilities, reporting channels, and manning considerations. Finally, gradual implementation procedures are recommended which balance the benefits derived from the matrix organization with the manpower it would require.

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SECTION I

INTRODUCTION

Purpose

The operating divisions of Air Force Systems Command (AFSC) contain Development Planning and program office activities. In general, the Development Planning offices have responsibility for activities related to the Conceptual Phase of the acquisition life cycle, while the program offices have responsibility for Demonstration/Validation, Full Scale Engineering Development, and Production of weapon systems. In addition, the Development Planning offices have a major role in the definition of technology requirements and transitioning of emerging technology into developing weapon systems.

As a result, there is a requirement for a reasonably strong interface between Development Planning and program offices. However, the people in these offices tend to have different values and objectives, and the interface activities are often handled in a marginal fashion and can become a source of friction between the two types of offices.

This report will describe Development Planning functions, with emphasis on program office interface activities. Responsibilities, organizational relationships, and problems will be covered in order to evaluate the potential use of a matrix type organization to improve the interface and facilitate the flow of information between organizations.

Explanation of Terms

This section defines terms used in the report and briefly describes the responsibilities of organizations discussed. It may be skipped without loss of continuity if the reader is familiar with Air Force Systems Command activities.

Air Force Systems Command (AFSC) The major command in the Air Force responsible for weapon system acquisition, encompassing all life cycle activities from the Conceptual Phase through the Production Phase. Subelements include laboratories, test activities, and the four divisions, listed below, which have acquisition responsibilities in the general areas indicated by their names:

1. Aeronautical Systems Division (ASD)
2. Electronic Systems Division (ESD) This division has primary responsibility for Command, Control, and Communications.
3. Space and Missile Systems Organization (SAMSO)
4. Armament Development and Test Center (ADTC)

Types of Planning Activities For the purpose of this report, planning activities were divided into four categories. In practice, there is considerable overlap between the four types.

1. Vertical Planning: Planning functions oriented toward a single mission, such as a satellite communications or tanker aircraft. Emphasis is on follow-on activities within the mission area.
2. Horizontal Planning: Planning functions which affect the mission or technologies of two or more program offices or the

the development of new missions. This function tends to be long-range planning requiring familiarity with a broad range of organizational activities and interfaces.

3. Program Implementation Planning: Planning functions required to implement program direction and assign responsibilities so all program participants mutually understand who is responsible for each acquisition action. This function is generally managed within a program office in accordance with AFSCP 800-3 (5:6 - 3)[1]. Tasks include program management planning, establishing required relations with other organizations, tracking fulfillment of direction, and program documentation.

4. Organizational Planning: The planning function concerned with the overall organizational structure, reorganizations, allocation of resources, assignment of major responsibilities, and, in general, the "health" and future of the organization as a whole. This function is often handled on an "ad hoc" basis with continuing responsibility divided between Manpower, Personnel, Comptroller, and Development Planning offices.

Independent Research and Development (IR&D) IR&D encompasses defense contractor research and development efforts which are funded indirectly through overhead on defense contracts. While these efforts

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[1]This notation will be used throughout the report for sources of quotations and references. The first number is the number of the source as listed in the bibliography. The second number, if appropriate, is the page(s) in the reference.

are initiated, managed, and controlled by the contractor, independent of contractual requirements, they must be related to a military mission. Both the government and industry wish to maximize the payoff of IR&D programs. Therefore, depending on the projected application of a particular effort, AFSC divisions have been "... designated as responsible for coordinating and summarizing the technical evaluation of project descriptions contained in contractor IR&D technical plans and arranging and conducting on-site technical reviews". (20, 1)

Technology Need Program AFSC laboratories are tasked to assist AFSC divisions in solving scientific, technical, and engineering problems (21, 1). The Technology Need Program is used to communicate technology requirements to laboratories from other AFSC organizations. AFSCR 80-29 (21, 1) defines a technology need as follows:

> A document which describes a specific item of research or technology required for the orderly development of systems, subsystems, or capabilities. Technology needs are categorized as:
>
> (1) Category I. A need that must be fulfilled by a given date if a system requirement is to be met and is so critical that the lack of the item will severely constrain planned system capabilities or mission accomplishment.
>
> (2) Category II. A desirable item that will provide an option for planned growth or improvement of systems or capabilities. This category includes technology needs in support of conceptual systems.
>
> (3) Category III. A promising item that will add to the technology base but is not in support of a specific system requirement. ...

Technology Program Assessments AFSCR 80-19 (1, 1) establishes policy to initiate, control, and advocate (nonsystems)

advanced development programs, provides a basis for recommending the allocation of resources, and enhances technology transfer into weapon system development programs. The regulation directs that AFSC divisions, with the Development Planning office normally acting as the focal point, assess such advanced development programs. "A formal evaluation by SAMSO, ASD, ESD, or ADTC of a proposed or ongoing program addressing relevance, payoff and benefit, priority, cost and schedule, and timeliness. Assessments on proposed programs will be an in-depth review. SAMSO, ASD, ESD, and ADTC will assess ongoing programs annually to reappraise all efforts previously assessed and of continuing interest to them." (1, 1)

Investment Strategy The purpose of investment strategy is to develop and implement a plan of action to optimize payoffs and resources invested in (primarily) exploratory development and advanced development programs in AFSC. A three step process is used to achieve this objective.

1. Air Force Systems Command Development Planning Goals are developed and, based on the availability of reasonable payoff opportunities, goals which will be pursued are selected and prioritized.

2. Resources are identified and organized to achieve desired goals. During this step, alternative and parallel technology approaches are developed with appropriate evaluation and decision points.

3. Progress and changes which could affect expected payoffs are evaluated continually in order to respond to changing requirements, development problems, or technological breakthroughs.

Development Planning offices at SAMSO, ASD and ESD, with support from program offices, evaluate appropriate programs on an annual basis to insure that their needs are accurately reflected in planned programs. This evaluation is oriented towards two to three years in the future with the emphasis on the current year plus two.

NOTE: The investment strategy process is relatively new and is still evolving. In 1977, the process was retitled "Investment Assessment" (6, 1), but still is made up of the same basic activities.

Scope and Approach

This report was written as a part of the course of instruction at the Defense Systems Management College (DSMC). Due to the limited time available, the report concentrated on development planning and program office activities at SAMSO, ASD, and ESD. ADTC was excluded because its responsibilities and functions have been evolving in the recent past and are not completely stabilized. Prior to being sent to DSMC, the author was assigned to SAMSO. While there, he gathered information on planning activies through personal interviews with supervisors in the Development Plans office and various program offices. The author supplemented this information, while at DSMC, through telephone interviews with similar supervisors at ASD and ESD and personal interviews with DSMC faculty and students who had appropriate previous experience in Air Force Systems Command.

SECTION II

PRESENT SITUATION

Organization and Functions

Development Planning Offices (also called Development Plans Offices) - In SAMSO, ASD, and ESD the Deputies for Development Plans report directly to the Division Commanders. The primary offices they interface with at Hq AFSC are the Deputy Chief of Staff/Development Plans and the Director of Science and Technology. While the functions of these two offices overlap considerably, the former has primary responsibility for Conceptual Phase planning activities, while the latter exercises operational control of AFSC laboratories.

As of the second quarter FY 77, the manpower authorizations for the three Development Planning offices were:

	OFFICERS	AIRMEN	CIVILIANS	TOTAL
SAMSO	85	1	29	115
ASD	18	1	117	136
ESD	58	8	48	114

Personnel in all three offices pointed out that their authorizations were cut approximately in half over the past several years. As a result, they felt that they did not have the manpower to properly accomplish their assigned tasks, and that there was little time available to do planning in an atmosphere free from constant "fire fighting" activities. In fact, two people from different Development Planning offices used the

same words, "We have to concentrate on the most critical areas." A review of the Organization and Functions books for SAMSO (17, 20-1 to 20-6), ASD (13, 13-1 to 13-5) and ESD (16, 13-0 to 13-5) shows that, in general, their responsibilities can be divided into three major areas.

1. All three offices are involved in the initial conceptual planning for future weapon systems. During the course of this work, preliminary systems documentation is prepared leading to substantiation for entry into the Demonstration/Validation Phase. A system program office cadre is normally developed within the Development Planning office for this work (ASD uses people provided by ongoing programs). Upon direction to enter the Demonstration/Validation Phase, the cadre is transferred to an existing program office, or, if sufficiently important, may become a new program office.

2. Development Planning offices sponsor and manage Air Force advanced development programs to design, develop and test components, subsystems, or techniques. These efforts are normally directed towards developing a technology base to support the division's (SAMSO, ASD or ESD) program offices across the board. One example is the Guidance Technology Office at SAMSO. The personnel in this office develop, and test components and technique applicable to military space vehicle guidance, navigation, and attitude control. (17, 20-4)

3. The three offices have a major responsibility in the transfer and integration of emerging technology into developing weapon systems and concurrently insuring that those technologies with the largest expected payoff are being pursued. The Development Planning

offices are the division's focal point for technology program assessments and investment strategy, and at SAMSO and ESD are also the focal point for technology needs (TNs) and Corporate Independent Research and Development (IR&D) programs. At ASD, Development Planning plays a major role in both TNs and IR&D, but the focal point for both activities is the Deputy for Engineering. The difference arises from the methods used to provide engineering support to program offices at the three organizations. At SAMSO and ESD, the Aerospace and Mitre Corporations, respectively, provide technical integration support under contractual arrangements while at ASD, the same support is provided by Air Force personnel assigned to the Deputy for Engineering. An additional difference between ASD and the other two divisions is that ASD is located on Wright-Patterson AFB, Ohio, where the majority of AFSC's laboratories are also located. Technology transfer and laboratory coordination is, therefore, much easier for ASD to accomplish than it is for SAMSO on Los Angeles Air Force Station in California or for ESD on Hanscom Air Force Base in Massachusetts.

In summary, development planning activities tend to have a long range payoff and require the coordination and integration of activities of several organizations. Development Plans offices are, therefore, generally responsible for horizontal planning and are in a good position to support organizational planning activities. (See Explanation of Terms in Section I for definition of planning categories.) In addition, the people in Development Plans, to be effective, should have a long-

range time orientation and should place value in the interests of SAMSO, ASD, or ESD as a whole, rather than just the Development Planning organization.

Program Offices The program offices at all three divisions are responsible for the Demonstration/Validation, Full Scale Engineering Development, and Production of assigned weapon systems or subsystems. In general, the program office directors report directly to the Division Commanders and their primary Hq AFSC interface is with the Deputy Chief of Staff/Systems.

Program offices are generally considered to be the prime mission elements of Air Force Systems Command, and they tend to have priority manning. Nevertheless, there is general agreement in AFSC that program offices are "thinly" manned, and that less critical program office jobs are not being done. For example, Program Control rooms to integrate various activities and schedules have virtually disappeared -- they have been traded off to provide manpower for other problems.

There are basically two types of program office in AFSC: Single system program offices such as B-1 or F-15, and mission area or "basket" program offices such as the Aeronautical Equipment Office at ASD or the Reentry Systems Office at SAMSO.

The single system program offices are totally involved in the day to day activities required to manage the system as it proceeds through its acquisition life cycle. There is a definite completion date projected for terminating the program office activities and little

concern for a follow-on system.

"Basket" program offices have similar day to day pressures, but they are also involved in planning follow-on activities within their mission areas. While individual programs may be terminated or completed, the program office, as a whole, will continue.

Both types of program office accomplish the implementation planning functions required to satisfy program direction, but only the "basket" program offices are involved in vertical planning. (Types of planning activities are defined in Section I under Explanation of Terms.) However, people in both types of program office tend to be absorbed in the near-term activities of managing assigned programs. As a result, they tend to have a near-term or present time orientation and place relatively little value in the performance of activities outside of the program office.

Problems Associated with the Present Situation

While much of the work going on in Development Planning and program offices can be managed independently of other organizations, there is considerable overlap in many areas. To insure cost-effectiveness, such work should be integrated -- where integration is the process, as defined by Lawrence and Loesch, "of achieving unity of effort among the various subsystems in the accomplishment of the Organization's tasks." (9, 4)

The majority of the problems in integrating the efforts of Development Planning and program offices stems from differences in attitudes and values of the people assigned to the two types of

organizations. As discussed previously, the people assigned to Development Planning have a relative long-term time orientation and view their work as supporting the total organization. People in program offices, on the other hand, are more concerned with near-term problems and are committed to program office goals almost to the exclusion of other people's objectives.

Program offices in AFSC tend to restrict the information that flows in and out of their organizations. They have creative, talented people who feel they can solve problems as they develop, but they are very pressed for time, handling the day to day workload. As a result, program office personnel -- especially at the worker level -- do not look to outside organizations for help and often have little familiarity with activities that do not affect them directly. When they know of something that may affect their program, an interface is normally established. There may well be other potentially beneficial interfaces that could be instituted, but the restricted flow of information in and out of the program office hides the need for the interface.

There are established contacts at top levels of management through various program review briefings and staff meetings. However, people are judged on their successes and decision-making ability -- not on their failures or problems. Program offices, therefore, try to solve their own problems and minimize blame for failure while maximizing credit for success. As a result, when lessons learned are formally published, they may be sanitized to the point where people do not think it is worth taking the time needed to read them.

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Due to this restricted flow of information from program offices and internal work pressures, personnel in Development Planning do not have a good feel for program office activities. That is, they know what program offices are doing in a gross sense, but they have little knowledge of day to day problems, progress, or pressures. They do not have the working knowledge of program activities to enable them to prioritize technology requirements or efficiently determine the expected payoff of proposed or ongoing technology efforts. In addition, most people in Development Planning do not have program office working experience. The Development Planning offices are, therefore, in a poor position to integrate the efforts and requirements of various program offices, and tradeoff decisions between efforts tend to be made, not at Division level, but at Headquarters Air Force level -- based primarily on funds availability and with little thought given to the Air Force manpower resources required to properly implement program management direction.

Nevertheless, Development Planning people are charged with performing an integration role with respect to technology needs, IR&D, technology program assessments, and investment strategy. (Development Planning's role in technology needs and IR&D at ASD is reduced since the Deputy for Engineering is the ASD focal point for those two activities.) As a result, Development Planning personnel must go to the program offices for information and inputs in these areas.

The program offices, on the other hand, do not see much immediate value in these exercises relative to activities that more directly impact their ongoing programs. They tend to view Development Planning as a "make work" organization, and, since they are not judged on the basis of their interface activities with Development Planning, requests for support often solicit the minimum response necessary to "kill the suspense". Inputs and updates are often superficial or incomplete and are often prepared by someone who has neither the time nor the inclination to do the job properly.

In summary, Development Planning is often seen as a "make work" organization by workers in the program offices. In supporting technology needs, IR&D, technology program assessments, and investment strategy, the program office personnel with the knowledge to do the job properly do not have enough time, and the people in Development Planning do not have the knowledge needed to integrate inputs or identify erroneous or incomplete responses.

SECTION III

PROPOSED MATRIX ORGANIZATION

Current Literature

One prominent approach to integrating the activities of diverse functions is the use of a matrix organization in which people from various functions are assigned to that organization to help it meet its goals. The author, therefore, surveyed the literature on matrix organizations to evaluate the potential of such organizations to reduce the problems discussed above.

There is extensive literature on matrix organizations (for example, see bibliography references 3, 4, 5, 7, and 9). A matrix organization is generally recommended for high priority, complex projects where the organization must integrate various functional activities in order to accomplish a common goal in an established time period. Personnel working in the matrix organization may be evaluated by people in either their parent functional organization or in the matrix organization which they are supporting. They may be physically located in either organization, but their day to day direction comes from people in the matrix organization.

There is also literature on coordination and integration procedures. The references which the author found helpful in formulating the organization proposed in the next subsection are briefly discussed below.

1. In their book, New Ways of Managing Conflict, Rensis and Jane Likert develop the idea of a "linking pin" or a person who is a

member of two groups and provides an information flow and reciprocal influence between the two groups. Properly used, a linking pin will "function as a channel between the two groups so that they both have before them the same statement of the problem and the same facts, knowledge of situational requirements, awareness of differences and conflicts, and other relevant information" (10, 187). The organization proposed in the next subsection to reduce Development Planning and program office interface problems will establish linking pins between the two groups.

2. Lawrence and Lorsch found that people who were effective in coordinating the efforts of two groups tended to have time and goal orientations which were intermediate to those of the people assigned to the two groups. In addition, the coordinator should have interpersonal relationships with both groups. When these conditions were not met, coordination problems arose (9, 31ff).

3. Athreya, in studying the contribution of the planning process to effective integration found that in "... divisions with the less effective planning processes, the planners contributions were not seen as valuable by managers from other divisions, regardless of their actual expertise". (2, 179) To be effective, planners must have accurate, up to date information and, therefore, need support from other organizations. To get such support, outside managers should believe the planners are providing a useful service.

4. In studying organizations, Brown pointed out that, "If the boundaries effect a tight screening of both information and

individuals so that only those people and pieces of information which reinforce the current internal values are allowed in, then the organization may facilitate internal agreement among its members. However, at the same time it may lose its position in its environment, such as when a firm gets into a rut with its technology and product line" (3, 321). In a dynamic environment, such as weapon systems development, program offices should open their boundaries to information and ideas so they can stay on top of changes and new developments.

The "Reverse" Matrix Organization

The organization proposed in this and the following subsections will be presented as an idealistic model. However, this simplification will be rectified in the Recommendation Section where discussions on implementation will more realistically consider real world advantages and disadvantages.

In the normal matrix organization, various functional people are brought together to work on a common problem. Benefit is received by the organization to which people are assigned, and not by their parent functional organizations.

To reduce the problems discussed earlier, this report proposes a "reverse" matrix organization with the characteristics listed below. The term "reverse" is used to indicate that the primary benefit will accrue, not to the office to which people will be assigned, but to the organization from which they come. In addition, the "reverse" matrix team will be composed of members working in different locations

and supporting different programs, rather than coming together to work on a common objective.

1. The members of the team will be assigned to an office in Development Planning for reporting and evaluation purposes.

2. The workers on the team will physically work in program offices, primarily on activities related to Development Planning and program office interface activities, but also charged with supporting other development planning activities and other program office interfaces with organizations developing relevant technology.

3. Only one member of the team will be assigned to either a single-system or "basket" program office.

4. The assigned team member should normally work in the program office plans division, if one exists, or in program control, if not.

5. Program directors would have the option of preparing a Letter of Evaluation on any team member assigned to their program.

6. Program office management would still sign out any documentation indicating a program office position.

In addition to the general areas of responsibility indicated above, the Development Plans team member assigned to a program office would also have the following specific functions.

1. He would be the focal point in the program office for all actions on technology needs, IR&D, technology program assessment, and investment strategy.

2. He would be the program office focal point for technology

transfer, interfacing with Development Planning offices and AFSC laboratories, and identifying potential applications of new technologies.

3. He would insure that development planning activities are accomplished with full consideration of program office problems, progress, schedules, technology needs, etc. That is, he would act as a program office representative in development planning activities, in addition to being a development planning representative in the program office.

4. He would be a source of information to the program office with respect to available and projected technologies and ideas and lessons learned from other program offices (via other team members).

5. As a member of the matrix organization, he would help to identify similar or overlapping activities in different organizations and thereby identify areas where potential economies could be made.

SECTION IV

DISCUSSION AND RECOMMENDATIONS

This section will cover advantages and disadvantages of the proposed "reverse" matrix organization with appropriate discussion to caveat the listed advantages or alleviate the potential disadvantages. In conclusion, recommendations on implementing procedures will be provided.

Advantages

The proposed "reverse" matrix organization would cause the team member to develop interpersonal relationships with people in both Development Planning and the program office to which he was assigned, and, since he would be working with both groups, he would normally develop a time and goal orientation intermediate to the two groups. In other words, the working structure should help to develop the personal traits and interpersonal relationships required for effective coordination. The system would establish "linking pins" between organizations at the worker or operating level, and provide a channel for informal communications to supplement the formal communications through higher level management channels.

The situation would normally be viewed as helpful to the program office. The team member assigned from Development Planning would be providing a valuable service by managing technology needs, IR&D, technology program assessments, and investment strategy actions, and

insuring that all inputs are complete and up to date. In addition, he would be providing a mechanism for improving the flow of technology into the program office.

Conversely, the organization should prove valuable to the Development Planning office. A channel would be provided to improve the information flow from program offices and keep Development Planning personnel up to date on problems, progress, and requirements. This would facilitate both the identification of technologies with the greatest expected payoff and identification of potential applications for developing or projected technologies.

The organization would provide channels for communication of problems, problem solutions, and lessons learned at the operating level where information could be transferred informally without being so sanitized by people concerned with how the information will impact their effectiveness ratings that it loses its value.

The program offices would, in fact, be opening their boundaries to permit more information to flow in and out of their organizations. They would be allowing someone from Development Planning into their organization who, relative to others in the program office, would have a longer range time orientation and a higher concern for the total division (SAMSO, ASD, or ESD). He should, therefore, place a relatively higher value on insuring that information which could prove useful to other offices be provided quickly and correctly.

While the job of being a member of the matrix organization could be a difficult one due to the need to effectively interface with two diverse groups, it should provide valuable experience to the person

assigned. He would be gaining both planning and program office experience while also interfacing with various technology development organizations. The job could, therefore, provide worthwhile career development. For example, a person being transferred from an AFSC laboratory would be well-suited to be a matrix team member due to his working knowledge of technology development efforts. And, after working on the matrix team, he could proceed to other program office jobs or work in Development Planning in either a planning or system program office cadre job.

There is a practical example which supports the advantages discussed above. The Air Force Materials Laboratory (AFML) has made a practice of assigning AFML representatives to various AFSC organizations in much the same way as Development Planning representatives would be assigned to program offices. In general, both AFML and the receiving organization have found the relationship beneficial: it has improved the flow of information and technology transfer, AFML has been able to stay on top of material technology requirements, receiving organizations have had a ready source to turn to with material problems, and both sides generally believe that the benefits have justified the resources expended.

Disadvantages

The major disadvantage is that the organization would require manpower -- at a time when manpower authorizations are scarce and

both Development Planning and program offices could use more people to properly satisfy their current direction. However, resources must be invested before there will be any chance of realizing the potential benefits.

The benefits generated by a Development Planning team member being assigned to a program office will, of course, be related to the amount of interface that office should have with the technology development community. The greater an office's technology interface, the greater is the potential value of assigning a team member to that office. In fact, a program office which is producing a single system using demonstrated technology, and is not planning follow-on activities, may perceive no value in such an assignment. Members of the program office may even view the team member as a "spy in our midst" and cut him off from information, so he would be of no value to either Development Planning or the program office. It may, therefore, not be advantageous to assign a team member to an office with low technology interface requirements. While he would normally be a source of valuable information for people in Development Planning, his not being in a position to help the program office could seriously reduce his effectiveness.

During interviews, several people expressed concern that a person assigned to work in a program office would lose his Development Planning orientation as he became involved in the day to day program office activities. Since this could defeat the purpose of the

matrix organization it would be incumbent on Development Planning management to play a strong role in the maintenance of Development Planning values among the matrix team members.

This should not be too difficult, since the team members would report to, and be evaluated by, a supervisor in Development Planning. This supervisor would naturally have a strong influence on group norms and values. Some of the steps the supervisor could take to preserve a balance between Development Planning and the program office orientations are:

1. Hold periodic staff meetings with the team and encourage the free flow of information between members.

2. Insure that team members get involved in Development Planning activities which are not strictly related to their program office support role.

3. Limit the length of the team assignments.

4. Periodically change the program office assignments of the team members. However, since the value of the concept depends largely on the establishment of good interpersonal relationships, such a step should not be taken lightly.

Recommendations

Approximately 30 manpower spaces would be required to fully implement the proposal at all three locations. If manpower resources were not severely constrained, a rapid establishment of the "reverse" matrix organization would be recommended. However, in view of manpower limitations, a gradual implementation, as described below, is recommended.

1. Implement the proposal initially at SAMSO or ESD in order to evaluate its benefits. Unfortunately, measurement of success will have to be based on subjective judgement. However, such judgement should be sufficient to provide a gross "go/no go" decision and determine appropriate modifications.

2. Assign team members to program offices based on the magnitude of the offices' technology interface -- assign the first team members to those offices with the largest interface, and last team members to single-system program offices that do not have planned follow-on activities. If technology interface is viewed as a continuum from extensive to minor, there may well be a point where benefits derived from assigning a man to a program office would not justify the manpower authorization. The manager of the matrix team will, based on actual experience with the team, and discussions with program managers, have to determine that point of marginal return and restrict the size of his team accordingly.

3. Establish an initial team with members assigned to at least four program offices in order to provide a "critical mass" upon which to base an evaluation.

4. If the organization is effective at the initial location -- SAMSO or ESD -- establish a team at the other location.

5. Establish a team at ASD last, considering the differences in the Deputy for Engineering functions, the proximity of laboratories, and a greater number of single-system program offies.

6. Allow the team manager, with agreement by affected program managers, to modify the matrix concept as necessary to suit local conditions.

7. Require joint Development Planning and program office agreement on the person assigned to the program office. Since interpersonal relationships will strongly influence the success of the organization, personality, in addition to background, should be a strong determinant in personnel selection.

8. (Further study) One person interviewed indicated that the same communication problems existed between the offices of the Deputy Chiefs of Staff for Development Plans and Systems at Hq AFSC as have been experienced in field divisions. If the concept is successful in the field, it is recommended that a similar, but suitably modified, matrix organization be evaluated for use at Hq AFSC to improve communication between DCS/Development Plans and DCS/Systems.

9. (Further study) If the concept is successful at SAMSO, ASD and ESD, consider establishing a similar organization at the Armament Development and Test Center.

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